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Adolescence and contraception

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Abstract

The age of adolescence is the time when most adolescents in the world become sexually active with resultant millions of pregnancies and sexually transmitted diseases. This paper considers methods of contraception for these adolescents, including oral contraceptives, transdermal contraception, mini-pills, intravaginal ring, injectable contraception, intrauterine devices, barrier contraceptives, implants, and others. It is important for clinicians caring for sexually active youth to provide information regarding contraception and appropriate contraceptive prescriptions.

Keywords: Adolescence, contraception

Introduction

The median age of first intercourse in the United States, Western Europe, Eastern Europe (Ukraine), Eurasia (Russia), and other parts of the world is 16 years of age, with many youth having multiple sexual partners. Clinicians caring for adolescents should ask about possible coital behavior and provide effective contraception to those youth continuing to be sexually active without intent of becoming pregnant (1-23). Table 1 lists questions helpful to ask when discussing contraception with adolescents—particularly if they are sexually active.

A number of effective and safe contraceptive methods (see Table 2) are available for the sexually active adolescent who wishes to avoid pregnancy. The most effective methods of contraception include abstinence, combined oral contraceptives (24), transdermal contraceptive patch (Ortho Evra®), vaginal contraceptive ring (NuvaRing®), progestin-releasing implant (Implanon®), IUDs, and intramuscular medroxy-progesterone acetate (Depo-Provera, DMPA); these methods have pregnancy rates under 1/100 woman years of use (see Table 3).

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Table 1. Questions for Adolescents Seeking Contraception

1. What methods have you used before, if any?
2. Did you have any problems with your previous method? What did you like/dislike?
3. Do you have any concerns about the different methods of contraception?
4. If your friends use contraception, what comments have they made?
5. Will you be able to use these methods correctly? Which ones?
6. Is your weight of concern to you? Have you been or are you now dieting?
7. Some methods may lead to unplanned, irregular bleeding. Can you deal with that?
8. Have you heard about any problems with the pill or other methods, such as possible weight gain or infertility?
9. Are you aware of minor side effects that the pill may cause?
10. Do you have questions I have not answered?

Table 2. Contraceptive Methods

Abstinence
Rhythm method of contraception (periodic abstinence)
Calendar
Ovulation method
Symptothermal
Postovulation
Oral Contraceptives (Combined)
Transdermal Contraceptive Patch (Ortho Evra)
Vaginal Contraceptive Ring (NuvaRing)
Mini-pills (Progestin-only pills; POPs)
Emergency contraceptives
Barrier contraceptives
Diaphragm
Vaginal contraceptive sponge
Cervical cap (Prentif Cavity-rim®)
Female condom (Reality®)
Vaginal spermicides
Male condoms
Injectable Contraceptives
Depo-Provera®
Lunelle®
Intrauterine Devices
Progestasert® IUD (with progesterone)
ParaGard® (Copper T380A IUD)
Mirena® (IUD with levonorgestrel),
Implants
Implanon
Norplant (no longer available in the US)
Sterilization
Female
Male (vasectomy)
Coitus interruptus

Unfortunately, the difference in contraceptive effectiveness between perfect use and typical use leads to millions of unintended pregnancies each year. Perfect use is defined as correct, consistent, and continued use of a method chosen by the sexually active patient. The less patient-dependent a method, the closer the typical usage is to the perfect usage. Thus, methods such as the implant, DMPA, and IUDs have typical usage that is virtually equal to perfect usage, and the intravaginal ring and transdermal patch have better typical usage than OCPs.

Table 3. Effectiveness of Methods

Method	Perfect Use	Typical Use
OCP	>99%	95%
Ortho Evra	>99%	98-99%
NuvaRing	98-99%	98-99%
DMPA	99.7%	99.7%
Mirena	99.9%	99.9%
ParaGard	99.4%	99.2%
Condoms	97%	86%
Implanon	>99%	100%*

*post marketing Pearl index of 0.024

Table 4. Methods to Deliver Steroids

Pills
Patch
Injectables
Implants
Vaginal Rings
Hormone-releasing IUDs

Table 5. Advantages of Newer Contraceptive Methods

Effective
Easy for the adolescent to use
Increased number of options
Improved compliance
Low hormone doses
Continuous low levels of hormones
Reversible

The barrier methods (male condoms, diaphragms, cervical caps, vaginal sponges, female condoms and vaginal spermicides) are not typically recommended as the sole contraceptive method for adolescents, unless they are mature and motivated enough to use them; even then, pregnancy rates are higher than with the methods identified above as the most effective ones.

Over the past 20 years, a number of newer contraceptive methods have been approved in the United States by the Washington, DC Federal Drug Administration; these include emergency contraceptives (Preven®, Plan B®), Depo-Provera®, the cervical cap, Lunelle® (injectable contraceptive with estrogen), Mirena® (an IUD with levonorgestrel), the contraceptive patch (Ortho Evra®) and an intravaginal ring(NuvaRing®). Over the past 15 years, research has developed various ways of contraceptive steroid release (Table 4), producing a number of potential advantages (Table 5). After OCPs were developed in the 1960s, the emphasis has been on having pill formulations that have reduced estrogen and progestin dosages along with the development of phasic and extended dosing regimens as well as the above mentioned newer hormone delivery methods.

This chapter reviews some of these important methods of contraception. Figure 1 lists frequency of contraceptive use by sexually active adolescents in the United States.

Oral contraceptives (OCPs; COCs)

One of the main contraceptives for several decades has been the combined oral contraceptive (COCs), containing synthetic estrogen (usually ethinyl estradiol [EE], occasionally mestranol) and synthetic progesterone (Table 6) (1-7).

The mechanisms of action for the combined birth control pill (OCPs or COCs) to prevent pregnancy include inhibition of ovulation, cervical mucus thickening, endometrial atrophy, and tubal transport changes. When discussing OCPs with adolescents, it is helpful to note the many benefits and uses of these pills, as listed in Table 7. OCPs are usually available as 28 day packs which contain 21 days of active pills containing consistent steroid dosages (mono-phasic) and placebo pills for the last 7 days to allow the adolescent to continue with one pill a day.

Variations are being developed, such as having only two days of placebo for each 28 day cycle and extended cycles.

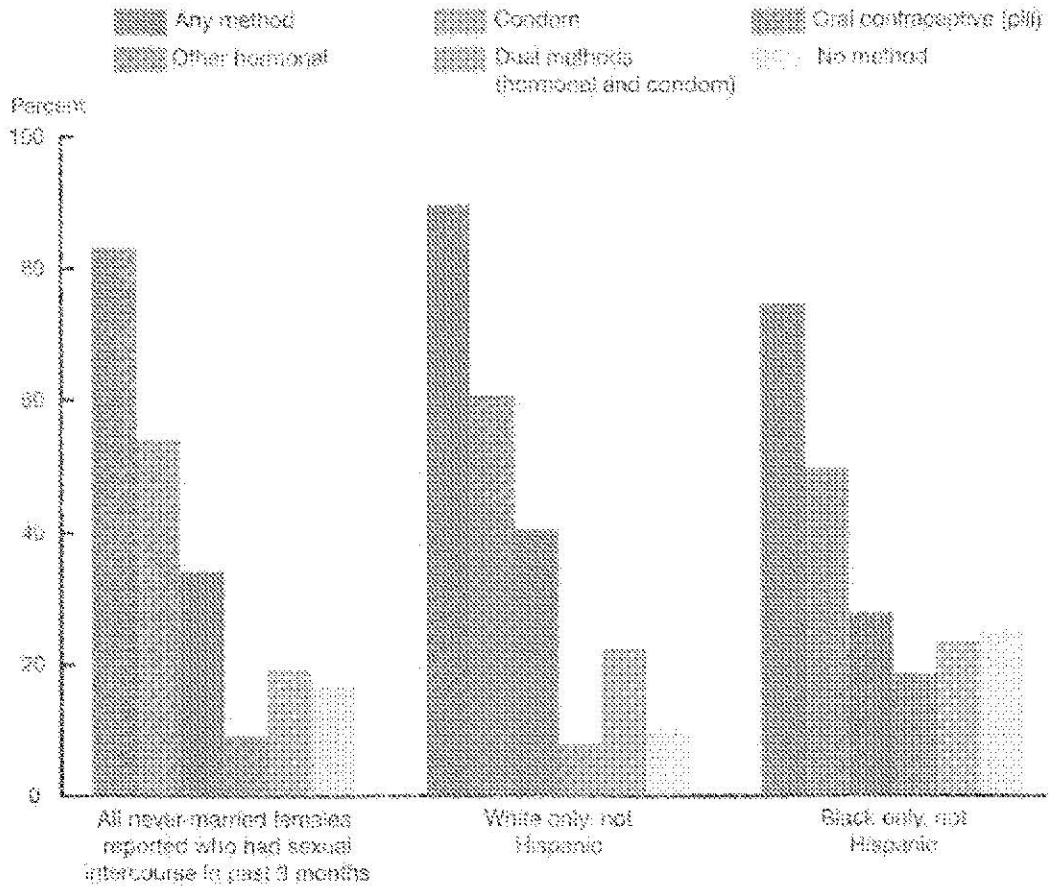

Figure 1. Contraceptive use among never-married female adolescents 15-19 years of age who had sexual intercourse in the past 3 months, by specified method used at last intercourse and race and Hispanic origin: united States, 2002.

Multiphasic pills have also been developed which contain steroid dosages that vary through the month (bi- or tri-phasic). There is no evidence that multiphasic pills provide any benefit over monophasic formulations and are often more expensive. There is also no evidence that one OCP brand is better than another; only that an individual adolescent may prefer or tolerate one brand over another. Generally, a pill with between 20 mcg and 35 mcg of EE is selected. While efficacy appears to be the same, pills containing 20 mcg or less of EE have been shown to have a greater rate of irregular bleeding than higher dose pills.

Some females benefit from extending their menstrual cycle to reduce the number of yearly menstrual periods. This method can used in those having problems worsened by their menstrual periods, such as those with epilepsy, headaches, menorrhagia, premenstrual tension syndrome, iron deficiency anemia, endometriosis, coagulation disorders, those receiving anticoagulation, athletes wishing to avoid a cycle during an important sports event, and others. 91 day packs are currently commercially available (Seasonique®, Seasonale®, LoSeasonique®).

Table 6. Combined Oral Contraceptive Hormones

COC's Hormones	
Estrogen *Ethinyl Estradiol* *Mestranol (3 brands)*	
Progestins *Norgestrel* *Norethindrone* *Norethindrone acetate* *Ethynodiol aceiate* *Gestodene*	*Levonorgestrel* *Norgestimate* *Desogestrel* *Drospirenone*

Table 7. Missed Oral Contraceptive Pills

EE Dosage of Pill	Number of pills missed	
30-35mcg	*1-2 pills missed:* Take last missed pill immediately and continue normal pill-taking scheudule. Back-up method not needed.	*3 or more pills missed*:* Take last missed pill immediately and continue normal pill-taking scheudule. Discard other missed pills. Back-up method needed for 7 days. Consider EC.
20mcg or less	*1 pill missed:* Take last missed pill immediately and continue normal pill-taking scheudule. Back-up method not needed.	*2 or more pills missed*:* Take last missed pill immediately and continue normal pill-taking scheudule. Discard other missed pills. Back-up method needed for 7 days. Consider EC.

*If missed pills occur during 3rd week, finish active pills, discard placebos, and start new pack.

Table 8. Use of Oral Contraceptives to Manage Various Disorders

Acne vulgaris
Coagulopathies (Anticoagulation Therapy)
Decreased risk of ectopic pregnancy, ovarian and endometrial cancer
Dysmenorrhea
Epilepsy
Endometriosis
Headaches
Hypothalamic amenorrhea due to eating disorders, exercise, stress
Iron Deficiency Anemia
Menorrhagia
Polycystic Ovary Syndrome (PCOS)
Premature ovarian failure/Turner syndrome
Premenstrual Syndrome (PMS)/Premenstrual Tension Syndrome (PTS)
Rheumatoid Arthritis

OCPs may be initiated according to three different schedules: Quick Start, First Day Start and Sunday Start. A urine pregnancy test may be performed if patient has had unprotected sex since last menses, and should be repeated if next menses is missed or there are other concerns for pregnancy. Emergency contraception may be considered if unprotected sex has occurred in the last 5 days.

For the Quick Start method, the patient should take the first pill immediately and back-up contraception should be used for 7 days (24). Quick Start may improve compliance, decrease confusion, and provide near immediate contraception. OCPs can also be started on the first day of the next menses and no back-up method is needed. Lastly, they may be started on the Sunday after the next menses, although back-up contraception is needed for 7 days with a Sunday Start.

This may cause confusion, difficulty with weekend refills, and delay in initiation, especially in women with irregular menses. Table 8 provides instruction on management of missed pills. The sexually active adolescent should be instructed that OCPs (COCs) do not prevent sexually transmitted diseases, and thus, condoms, are also recommended.

Contraindications to OCPs/COCs

Counseling sexually active youth about OCPs involves discussing conditions that may present increased risks for the adolescent. The World Health Organization (WHO) has published guidelines for medical eligibility to help in this endeavor (Table 9).

Females in WHO Category 1 have no restrictions to using OCPs, while those in WHO Category 2 have some increased medical risk. However, OCPs and other combined hormonal contraceptives should still be considered for those in Category 2 as the risk of pregnancy may outweigh the medical concerns.

Females in WHO Category 3 have such an increased risk that they are not placed on OCPs unless there is no other available, effective, contraceptive agent. Finally, those in WHO Category 4 are not placed on the OCP because the medical risks are too great.

Table 9. WHO Medical Eligibility Categories for OCPs*

Category One (No Restrictions)
- Antibiotics
- Benign breast disease
- Benign ovarian tumors
- Cervical ectropion
- Dysmenorrhea,
- Endometriosis
- Epilepsy
- Family history of breast cancer
- Gestational trophoblastic disease (benign or malignant)
- Headaches (mild)
- History of ectopic pregnancy or abortion (post abortion after first or second trimester),
- History of gestational diabetes
- Increased STD risk
- Iron deficiency anemia
- Irregular menstrual bleeding
- Obesity
- Ovarian or endometrial cancer
- Past pelvic surgery
- Pelvic inflammatory disease
- Postpartum at or over 21 days
- Thyroid disorders (as hypo/hyperthyroidism, simple goiter)
- Varicose veins
- Various infections :malaria, tuberculosis, others)
- Sexually transmitted diseases
- Viral hepatitis carrier

Category Two (Caution)
- Cervical cancer
- Diabetes mellitus (uncomplicated)
- Headaches (severe and if they start after beginning OCPs)
- Hypertension at 140-159/100-109 mm Hg
- Major surgery without prolonged immobilization
- Migraine headaches without focal neurologic involvement.
- Patients who have a hard time taking the OCP correctly:
- drug or alcohol abuse
- mental retardation
- persistent history as poor OCP takers
- severe psychiatric disorders
- Sickle cell disease or sickle C disease
- Undiagnosed breast mass

Category Three (Usually no OCP given)
- Gallbladder disease
- Lactating (6 weeks to 6 months),
- Less than 21 days postpartum
- Medications that interfere with OCP efficacy
- Undiagnosed abnormal vaginal/uterine bleeding.

Category Four (OCP contraindicated)
- Breast cancer
- Cerebrovascular accident (active or history)
- Complicated structural heart disease (with pulmonary hypertension, atrial

fibrillation or history of sub acute bacterial endocarditis)
Coronary (or ischemic) heart disease (active or history)
Deep vein thrombosis or pulmonary embolism (active of history)
Diabetes mellitus (complicated with retinopathy, neuropathy, nephropathy)
Headaches (including migraine headaches) with focal neurologic symptoms
Hypertension (severe: (160+/110+ mm Hg or with vascular complications)
Lactation under 6 weeks
Liver disease (including liver cancer, benign hepatic adenoma, active viral hepatitis, severe cirrhosis)
Pregnancy, complicated
Surgery (involving the lower extremities and/or prolonged immobilization

*Used with permission from Greydanus DE: Contraception. In: Course Manual for Adolescent Health. Eds: DE Greydanus, DR Patel, H Pratt, S Bhave. Ch. 20:309-324, 2002.

Cardiovascular risks and OCPs

If the adolescent has had a venous thrombosis in the past, OCPs are contraindicated (25-27). Venous thrombosis (VT) risks are greater in the adolescent and young adult female than risks for arterial thrombosis. Morbid obesity is a well-known risk factor for VT, though the amount of increased risk in the otherwise healthy adolescent is not known. Most adolescents who develop a VT do not have identifiable risk factors. Screening questions for adolescents seeking OCPS in regards to VT are listed in Table 10.

Table 10. Questions about personal/family history of thromboembolism

1. Have you or a close family member (including uncles/aunts) had blood clots in legs or lungs?
2. Have you or a close family member been hospitalized for blood clots in legs/lungs?
3. Have you or a close family member taken blood thinners?
4. Under what circumstances did the clot form? (e.g. during air travel)

Table 11 lists risk factors for thrombosis. Death from cardiovascular disease (arterial and venous) can occur among 20-24 year old females at 2-6 per million per year.

Thus, death from the OCP is a small, but known risk, though the risk of death from pregnancy is much greater. The OCP should be stopped if the adolescent has a condition requiring prolonged bed rest, as with major surgery.

Smoking should be discouraged in the adolescent but is not a reason by itself to avoid OCPs. Blood pressure can increase in those on OCPs and should be monitored. If there is a personal or family history for increased lipids, the OCP is permitted if the low density lipoprotein range is under 160 mg/dl or the triglycerides under 250. Other guidelines may be used by the clinician if these guidelines are not accepted in one's region.

Table 11. Risk Factors for Thombosis

Pregnancy
Factor V Leiden mutation
Prothrombin mutation G20210A
Hyperhomocysteinemia from mutations in MTHFR gene
Deficiencies of Proteins: C, S, or antithrombin III
Synthetic oestrogen use
Tobacco use
Other medical risk factors: immobilization, surgery (especially orthopaedic and pelvic), cancer, obesity, severe illness, other thrombophilias

OCPS and miscellaneous risks

There are a number of so-called "minor" adverse effects that are well-known with OCP use, such as headaches, mood changes, nausea, and breast tenderness. These effects are usually tolerated, and do disappear with cessation of the pill.

Though often linked to OCPs, there is no clear evidence that weight gain is the directly caused by OCP/COC use. Uterine breakthrough bleeding can be seen with OCPs and is a common cause for stopping the OCPs. Breakthrough bleeding usually resolves

with continued use of the same OCP. Occasionally a change to another brand is necessary. If the break through bleeding is significant, the patient should be evaluated for other causes.

Adolescents with well-controlled diabetes mellitus usually do well with low dose OCPs; OCPs are not continued if complications arise, such as hypertension, retinopathy, nephropathy, or neuropathy. Some clinicians recommend that OCPs be avoided in those with migraine headaches having auras and in those with worsening headaches on the OCP.

Some anticonvulsants lead to reduced OCP efficacy. These include barbiturates, phenytoin, carbamazepine, felbamate, topiramate, and vigabatrin. A number of other medications can also interfere with OCP efficacy, such as rifampin, griseofulvin, ketoconazole, itraconazole, and others. Antacids and OCPs should be separated by at least 3 hours. Those with active liver disease should avoid OCPs.

Transdermal hormonal contraception

The use of the patch to provide contraception has become a popular method for many adolescents and is based on decades-long research in using transdermal mechanisms to deliver medication. Patients should be advised that the same adverse effects as OCPs apply, with the possible addition of increased breast symptoms, and local dermatitis at the patch site. The contraceptive patch is about the size of a matchbook and placed on the skin in various sites: upper outer arm, buttocks, upper torso, and abdomen; it is not placed on the breasts or skin that is irritated or cut. The patch produces a daily release of 20 mcg EE and 150 mcg of norelgestromin, a hormone that is the active metabolite of norgestimate. The patch is typically started on the first menstrual day, replaced weekly for three weeks, and then no patch is placed on week 4 allowing menses to occur. A Quick Start, as discussed above, may also be used for initiation. A different site is chosen with each patch application.

Pregnancy rates are similar to the OCPs, 0.7 to 1.24 per 100 woman-years with the patch versus 2.18 for OCPs*. This rate is not affected by exposure to water baths or saunas, strenuous exercise, or warm, humid climates. Increased risks for pregnancy include wearing a patch over 7 days, patch detachment, and not placing a patch after being off for 7 days. If the patch detaches, it should be reattached immediately. If the patch cannot be reattached with its own adhesive, a new patch should be placed and the patient should place the next patch on schedule. If the patch is off for over 24 hours or the patient is more than 2 days late in changing it, a back-up contraceptive method should be used for 7 days. Some concern has been raised that pregnancy risks may be increased in females over 90 kg. COC efficacy is reduced in obese females but is better than noted with use of barrier methods alone. This reduced efficacy is due to increased basal metabolic rates, augmented adipose tissue sequestration, and increased hepatic metabolism of enzymes found in obesity.

NuvaRing vaginal ring

NuvaRing is a flexible, transparent, soft vaginal ring made of an ethylene vinyl acetate copolymer with two steroid reservoir cores providing a daily release of 15 mg EE and 120 mcg of etonogestrel (desogestrel metabolite). It is placed in the vagina by the adolescent for three weeks and then removed for one week. Quick Start is possible. If the ring is expelled, it is simply cleaned and placed back in the vagina; if the ring is removed for over 3 hours, a back-up method of contraception is needed until the ring is back in the vagina for 7 days.

It is an excellent method of contraception for those who are comfortable with their bodies. Adolescents are often reticent to use the ring due to the method of insertion and removal. Insertion can be simplified by placing the NuvaRing in an empty tampon applicator and using the applicator to insert the ring. The user needs to be counseled that the ring does not prevent STDs.

Advantages of the ring include excellent contraceptive efficacy, easily placed as well as removed, confidential method, continuous hormone release, and rapid return of ovulation after cessation of the method. Potential adverse effects include vaginitis, vaginal discomfort, foreign body sensation, as well as the common side effects of all COCs as mentioned above.

Progestin-only pills

Progestin-only pills (POPs) provide contraception by cervical mucus thickening and endometrial atrophy; ovulation is not reliably inhibited, leading to pregnancy rates of 1-3 or more per 100,000. Progestins used in POPs include 0.35 mg of norethindrone (Micronor®; Nor-Q.D®) and 0.075 mg of norgestrel (Ovrette®).

POPs are suggested by some clinicians for sexually active females with a contraindication to estrogen (such as hypertension or coronary heart disease). They are also used in females who are breastfeeding. Typical adverse effects of POPs include amenorrhea and irregular uterine bleeding. POPs should not be used by females with ectopic pregnancy history or taking certain medications, such as anticonvulsants, rifampin, and griseofulvin. POPs are not typically recommended for adolescents due to the above increased pregnancy risk and the need for an active pill (no placebos) to be taken at the same time daily making compliance difficult for teens.

Emergency contraceptives

Table 12 lists some of the emergency contraceptives (ECs) that have been available (28). The Yuzpe regimen uses a combination of EE (100 mcg) and a progestin and results in significant nausea due to the high dose of estrogen (use of antiemetic is recommended), while Plan B contains levonorgestrel only and thus produces less nausea and has been shown to be somewhat more effective than the Yuzpe regimen. The expected pregnancy rate from one unprotected coital episode is about 8%; this is reduced to less than 1% with some ECs if used within 24 hours of unprotected sex. EC is most effective if used within the first 72 hours after unprotected sex or contraception failure, but may be taken up to 5 days after coitus. If the patient is pregnant while taking ECs, the fetus is not harmed. ECs are over-the-counter in many parts of the world. They should not be used as regular contraception. Reasons to use ECs include having sex without protection, slippage or breaking of a condom, missing 2 or more oral contraceptive pills in a row, barrier contraceptive dislodgement (such as a diaphragm or cervical cap), intrauterine device (IUD) dislodgement, or being over 14 weeks from the last Depo-Provera® injection.

Injectable contraceptives

Medroxy-progesterone acetate (Depo-Provera®; DMPA) is a commonly used injectable contraceptive that inhibits ovulation, thins the endometrium, and thickens the cervical mucus. It is most commonly used in the intramuscular formulation, but a subcutaneous version has been developed which may show promise for self administration in the future.

It is a reliable contraceptive if taken on a regular basis at a dose of 150 mg every 12 weeks. A very low pregnancy rate is noted at 0.3%. It does not contain estrogen and thus, can be used for those with contraindications to using estrogen. Bone loss is noted in adolescents on this contraceptive – an average of 3.1-5% after 2 years of use. However, several studies have shown significant bone mineral density recovery after cessation of DMPA, though it is unclear yet whether DMPA decreases peak bone density when used during adolescents. Therefore, DMPA should be used with caution in youth at risk for low bone density, such as those with chronic renal disease, anorexia nervosa, and those with limited mobility (29). Use of Depo-Provera often leads to irregular menstrual periods and then, amenorrhea.

Table 12. Emergency Contraception

- Ovral® : 2 tablets by mouth immediately followed by 2 tablets in 12 hours
- Lo/Ovral®, Nordette® or Levlen® : 4 tabs and 4 more in 12 hours
- TriPhasil® or Tri-Levlen® (yellow tabs only): 4 tabs, and 4 more in 12 hours
- Ovrette®: 20 tabs and 20 more in 12 hours
- Preven® Emergency Contraceptive Kit
- Plan B®: levonorgestrel, 0.75mg followed by 0.75 mg in 12 hours

Table 13. Partial List: Side-Effects of Depo-Provera®

Acne
Amenorrhea
Behavioral changes (depression, anxiety, irritability)
Breast tenderness
Decreased bone density
Dizziness
Fatigue
Glucose intolerance
Hair loss
Irregular menstrual bleeding
Nausea
Weight gain

Table 13 provides a partial list of adverse effects. Benefits of this contraceptive include reliable contraception, reduced dysmenorrhea, less seizure activity in some females with epilepsy, and lower premenstrual tension syndrome.

Other injectable contraceptives that are available are Lunelle® (United States); Cyclo-Provera, and Cyclofem (5 mg estradiol cypionate and 25 mg medroxy-progesterone acetate [MPA/E2C]); these combination injectables (containing estrogen and progesterone) are given intramuscularly every month (every 28-30 days) and have very high contraceptive efficacy. Since it contains estrogen, dysfunctional uterine bleeding and amenorrhea are not as common as noted with Depo-Provera. Another injectable product is Mesigyna® (with 50 mg of norethindrone and 5 mg of estradiol valerate).

The etonogestrel-releasing implant (available as Implanon® in the US since 2006) is a subdermal implant consisting of one 40mm long, 2mm diameter rod. This rod is made up of a core containing 68 mg of etonogestrel within a rod of ethylene vinyl acetate copolymer covered in a membrane of the same material.

This implant is inserted subdermally, typically in the region of the bicipital groove, using the sterile preloaded inserter. Implanon provides 3 years of contraception by releasing a steady dose of progestin causing inhibition of ovulation and increasing cervical mucus viscosity. As a progestin-only method of contraception, the implant does not have the side effects or contraindications associated with estrogen containing methods. Unlike Medroxy-progesterone acetate, the implant does not cause decreased levels of estrogen and thus does not decrease bone density.

The benefits include high efficacy, long-acting, non-estrogen containing, cost effective, requires little effort of the part of the patient, rapid return to fertility, and the benefits of other progestin only methods.

Adverse affects include irregular bleeding, headaches, acne, weight gain, possible mood disturbance, and increased blood pressure. If irregular bleeding occurs, the patient should be evaluated for other causes.

If no other cause is found and the bleeding is significant or disruptive for the patient, NSAIDS, combined oral contraceptives (varying regimens), or ethinyl estradiol have been shown to be effective to treat break through bleeding due to the implant and possibly other progestin-only methods as well.

The effect of Implanon may be decreased in those with liver disease and by medications that induce CYP3A, such as many antiepileptics, rifampin, and St. John's wart. Like DMPA, many women eventually experience amenorrhea with the implant. Barriers to use include cost and the need for insertion and removal.

The need for removal by a trained professional may also be seen as a benefit in the adolescent population as this gives the practitioner an opportunity to counsel the patient on family planning, safer sex practices, additional contraception options, and conduct appropriate screening prior to the adolescent discontinuing this method, which may decrease unintended pregnancy. Overall, implantable contraception is an excellent option for teens.

Intrauterine device (IUD)

A number of IUDs are available in the world; the three types available in the United States are Progestasert IUD®, the ParaGard® (Copper T380A) and the Mirena® IUD. Table 14 lists the contraceptive mechanisms of IUDs. Progestasert IUD® is replaced annually and has an expulsion rate of 2.7%, while ParaGard® is replaced every 8 to 10 years and has an expulsion rate of 5%. In the United States, concern has been raised about a possible link between its use and pelvic inflammatory disease in females due to often criticized research dating to the 1980s. Though controversial, it has limited the use of IUDs in adolescents in the U.S; it is used by 12% of contraceptive-using women throughout the world. Data on the currently available IUDs show no increase in risk of PID unless the patient has an infection with Chlamydia or gonorrhea at the time of placement. Therefore, patients should be screened for STIs prior to IUD placement.

Table 14. IUD Contraceptive Effects

1.	Prevents fertilization
2.	Interferes with ovum development
3.	Interferes with sperm movement and ability to penetrate ovum
4.	Inhibits sperm survival
5.	Helps prevent egg release
6.	Thickens cervical mucus

Mirena IUD (Levonorgestrel-containing IUD; LNG-IUD) is a second-generation of steroid-releasing IUD. It releases 20 mcg of levonorgestrel per 24 hours over the first 5 years of use, decreasing to 10 mcg per day after 5 years. It is a popular IUD used by over 2 million women in the world. It has a failure rate of 0.2% in the first year and 0.7% at 5 years. It exerts a local effect on the endometrium as well as the cervical mucus; ovulation may continue and endometrial thinning can lead to amenorrhea. Table 15 lists potential adverse effects of Mirena IUD, the most common of which is irregular bleeding. It has been used to reduced menstrual bleeding in females with dysfunctional uterine bleeding, because it can reduced menstrual blood loss by 90%. Contraindications to Mirena IUD use include distorted uterine cavity, history of sub acute bacterial endocarditis, prosthetic heart valves, and active pelvic inflammatory disease.

Table 15. Mirena IUD Side Effects

Common	
	Initial increased menstrual bleeding
	Abdominal pain
Uncommon	
	Acne/other skin problems
	Back pain
	Breast tenderness
	Headache
	Nausea
	Mood changes
Rare	
	Hypersensitivity reaction
	IUD becomes embedded in myometrium
	Perforation of uterus or cervix

ParaGard® (Copper T380A) is a copper T IUD which prevents pregnancy by the interference of sperm motility by the copper ions. ParaGard® is highly effective with a first year failure rate of 0.8% with typical usage and a high rate of continuation among adolescents. The primary benefit to ParaGard® is that it is non-hormonal and can therefore be used as reliable contraception in those with contraindications to hormone use, history of side effects with hormonal contraception or those patients wishing to avoid hormone usage for other reasons. Adverse effects are primarily increased dysmenorrhea and menstrual bleeding, abdominal pain, expulsion and rarely perforation. Contraindications are similar to those for Mirena. In general, IUDs are a safe, effective, long-term method of birth control that can be used in nulliparous adolescents. While not recommended for teens at high risk for STIs, IUDs have not been found to increase risk of PID, nor have they been found to affect future fertility.

Barrier methods

Diaphragm and vaginal spermicides

Table 16 lists barrier contraceptives. These methods are only recommended for highly motivated sexually active individuals. Clinicians can learn to fit

diaphragms, help determine the proper size and teach the youth successful use of this method. The diaphragm is used with vaginal cream or foam and is often used with the condom. Vaginal contraceptives or spermicides include foams, jellies, creams, suppositories, and a contraceptive film. Contraindications to diaphragm use are listed in Table 17 and advantages of vaginal contraceptives are listed in Table 18. Side effects include vaginal odor and in rare cases, allergic reactions. Females who have diabetes mellitus and use a diaphragm have increased risks for urinary tract infections. In rare cases, toxic shock syndrome may occur and the diaphragm is contraindicated in a female having a history of toxic shock syndrome.

Table 16. Vaginal Barrier Contraceptives

Diaphragm
Cervical cap (Prentif®)
Vaginal contraceptive sponge
Vaginal spermicides
Female condom (Reality®)
Male condom

Table 17. Contraindications to Use of the Diaphragm

Allergy to rubber or spermicides
Anteversion (severe; forward tilting of uterus)
Complete uterine prolapse
Perineal tears
Retroversion (severe; backward tilting of uterus)
Short anterior vaginal wall
Vesicovaginal (or rectovaginal) fistulas
Toxic Shock Syndrome

Table 18. Vaginal Contraceptive Advantages

Allows the pair to share contraceptive responsibility when used with a condom
Can reduce dyspareunia if present (vaginal lubricant)
Cost is minimal
Prescription is not needed
Provides effective contraception, especially if used in conjunction with condom or diaphragm
Side effects are few
Useful for young women with only occasional coitus

Cervical cap

The Prentif® cavity-rim cervical cap is a small, latex cap (with spermicide placed inside) that is half the size of a diaphragm and fits around the cervix via suction. Four cervical sizes are available and about one-fourth of females cannot be fitted with a cervical cap. The clinician should obtain cervical cytology before and at the time of cervical cap fitting because cervical dysplasia has been reported in cap users; additional cervical cytology is also recommended three months after the fitting. Contraindications to cap use include cervical laceration, cervical scarring, and a history of toxic shock syndrome.

Vaginal contraceptive sponge

The sponge is made of polyurethane with a concave shape; it is a disposable method available without prescription, inserted in the vagina up to 2 days before sex and left in place 6 to 24 hours after coitus. Adverse effects include vulvar rash, vaginal odor, pruritus, candidiasis, and increased risk for urinary tract infection as well as toxic shock syndrome. Its contraceptive efficacy is similar to other barrier contraceptives.

Female condom

The female condom is a polyurethane bag or sheath that does not require a prescription. It is placed in the vagina prior to coitus; it is not used with a male condom. Some STD protection is provided by the female condom and its overall contraceptive efficacy is similar to that of other barrier contraceptives—acceptable, but not as good as oral contraceptives.

Male condom

Male condoms are recommended to reduce the risk for STDs as well as pregnancy. Their contraceptive efficacy is similar to other barrier methods. They must be used correctly with each act of coitus or their efficacy becomes considerably reduced.

Latex condoms are associated with increased breakage rates when exposed to high temperatures and/or ultraviolet light; they are also weakened by exposure to oil-based lubricants. Latex allergy is noted in 7% of the general population and the polyurethane condom can then be used. In general, male condom usage should be encouraged in the adolescent population primarily for sexually transmitted infection (STI) prevention. However, barrier methods are typically not recommended as the sole method of birth control in adolescents.

Conclusion

Contraception is an important concept for sexually active youth who wish to prevent unwanted, unplanned pregnancy. This paper has reviewed effective methods of contraption that are available. Clinicians caring for adolescents should ask about the sexual behavior of these youth and provide advice on contraception, beginning with abstinence.

Sexual responsibility involves prevention of unwanted pregnancy, premature childbearing, and STIs. A summary of contraceptive options for sexually active adolescent females having chronic illness is provided in Table 19.

Table 19. Chronic Disorders and Contraception (Greydanus, 2010; 2010; WHO, 2004; 2008; CDC, MMWR, 2010)

Disorder	Recommended Methods	Concerns	Additional Comments
Antiphos-Pholipid Antibody (aPl) Syndrome	DMPA or the Mirena IUD/IUS	See increased risks for thombosis in these patients and thus, avoid COCs. Avoid COCs in these patients with moderate or high titers of antiphospholipid antibodies (i.e., at or over 40 GPL or MPL units).	Risk of thrombosis is especially increased if other risk factors for thrombosis are present.
Cancer	Potentially All Methods; see various cautions. For example: Avoid DMPA if taking chemotherapy due to increased risks for infection from neutropenia or an injection-induced hematoma due to thrombocytopenia (TCP). Chemotherapy-induced bone loss may be increased by DMPA. Avoid IUDs for those with neutropenia or TCP. Caution with contraceptive implants for those with TCP and irregular menstrual bleeding.	COCs are contraindicated in those with breast cancer. Progestin and estrogen receptors are noted in ovarian cancer tissue; thus, COCs are not prescribed to patients with ovarian cancer. Avoid the mini-pill with a positive history for ectopic pregnancy or if taking meds with drug interactions (i.e., certain anticonvulsants, griseofulvin, rifampin).	COCs may reduce risks for ovarian and endometrial carcinoma. Pregnancy worsens breast cancer, endometrial cancer, ovarian cancer, malignant gestational trophoblastic disease, malignant liver tumors (hepatoma) and hepatocellular liver carcinoma (CDC, 2010).
Congenital Heart Disease (CHD)	DMPA and mini-pill are recommended for those with CHD if stable. Mirena IUD/IUS is usually OK. Observe for potential adverse reactions during IUD placement, such as syncope, bradycardia, and seizures. Avoid IUD if patient is on anticoagulation due to increased risk for bleeding with IUD placement.	Those on COCs have increased risk for thrombophlebitis, vascular thromboses (arterial or venous), and pulmonary embolism. Void COCs (including patch) with a positive history for these conditions. See the text. Avoid COCs if there is increased risk for thrombo-Embolism or endocarditis—depending on the type of CHD. COCs (including the patch) are avoided in those with CHD with cardiac shunts, congestive heart disease, low output cardiac disorders, and coronary heart disease. Avoid COCs (including patch) in those with CHD and pulmonary hypertension.	Females with valvular heart disease and other CHD may be at endocarditis risk during IUD placement and one month after the placement. Pregnancy is associated with increased adverse health effects in ischemic heart disease, complicated valvular heart disease, peripartum cardiomyo-pathy, stroke (CDC, 2010).

Table 19. (Continued)

Disorder	Recommended Methods	Concerns	Additional Comments
Diabetes	All methods are acceptable if the metabolic status is stable: COCs, DMPA, mini-pill, IUDs, mini-pills.	COCs should be avoided in any adolescent female with diabetic complications (peripheral vascular disease, nephropathy, and retinopathy), vascular sequelae (i.e., venous thrombosis), or hypertension. DMPA is safe even with the presence of diabetes complications. IUDs may induce chronic or resistant *Candida albicans* vaginitis in some.	COCs do not worsen the metabolic status. Newer OC progestins (norgestimate, gestodene, and desogestrel) may cause less carbohydrate metabolism effects than the older progestins. Pregnancy is associated with increased adverse health effects in insulin-dependant diabetes mellitus with complications (CDC, 2010).
Epilepsy	DMPA; IUD (Mirena and copper); Barrier contraception	Caution with COCs since there can be interference with some antiepileptic drugs with increased pregnancy risks: Carbamazepine (Tegretol) Phenobarbital Phenytoin (Dilantin) Primidone (Mysoline) Topiramate (mild inducer) (Topamax)	Avoid Mini-pill due to increased risk for pregnancy and potential teratogenicity of antiepileptic medications. Pregnancy is associated with increased adverse health effects in epilepsy (CDC, 2010).
Hyper-lipidemia	All methods are recommended for stable hyperlipidemia. Use low-dose COCs.	Avoid COCs if low density lipoproteins (LDL) level is over 160 mg/dl, triglycerides are over 250 mg/dl, or in situations with the existence of multiple risk factors for coronary artery disease (CAD): diabetes mellitus, hypertension, obesity, smoking and positive family history for premature CAD.	Research notes that estrogen can lower high density lipoprotein levels, raise LDL levels, and increase triglyceride levels.
Hyperten-sion	All methods are used if the condition is stable.	Avoid estrogen-containing methods for unstable hypertension (such as blood pressures over 160/100 mm Hg). Pregnancy is associated with increased adverse health effects in uncontrolled hypertension (CDC, 2010).	COCs result in a small increase in blood pressure—higher increase in anecdotal situations.
Inflamma-tory Bowel Disease (IBD)	All methods are usually acceptable. Avoid DMPA on a prolonged basis in those on corticosteroids due to bone loss exacerbation.	COCs may reduce bowel symptoms in active colitis; COCs efficacy may be lowered due to increased break-through bleeding and reduced OC absorption. Use the patch if gastrointestinal absorption may be a problem. Mirena IUD/IUS appears to be effective and safe.	DMPA may reduce break-through bleeding and secondary anemia; may be best for combination of IBD and coagulation disorders.
Intellectual Disability	See schizophrenia		
Liver Disease	DMPA and IUDs are safe with active liver disease. Barrier contraception is also fine (except for the increased pregnancy risks inherent in this method).	Avoid COCs in those with active liver disease (including hepatitis and cirrhosis). COCs are OK when the liver function tests return to normal. Unknown the effect of obesity-induced NASH (non-alcoholic steatohepatitis) on COC efficacy.	Incidence of hepatic cell adenoma is 3.4/100,000 pill users. Pregnancy is associated with increased adverse health effects in severe (decompens-ated) cirrhosis (CDC, 2010).

	Recommended Methods	Concerns	Additional Comments
Migraine Headaches	Depo-medroxy-progesterone acetate (DMPA), the mini-pill (progesterone-only pill), and the Mirena IUD in addition to barrier contraceptives.	Females with complicated migraine headaches (i.e., with neurological symptoms) have heightened risk for cerebral ischemia and cerebrovascular accidents (CVAs) if placed on combined oral contraceptives because of estrogen effects	Use COCs with caution in those with migraines and stop if auras develop and/or the headaches become worse.
Obesity	Levonorgestrel IUD and mini-pills may be the best option for the morbidly obese adolescents. COCs or intravaginal ring are recommended unless estrogen-contraindications arise (as thrombo-embolism, others).	COCs are good management choices for obese youth needing contraception as well as polycystic ovary syndrome, hirsutism, and acne vulgaris. DMPA may induce weight gain and this should be closely monitored.	COC efficacy is reduced in obese females but is better than use of barrier methods alone, The reduced efficacy is due to increased basal metabolic rates, augmented adipose tissue sequestration, and increased hepatic metabolism of enzymes.
Pulmonary Disease	All methods are acceptable in patients with cystic fibrosis (CF) with no other contraindications for contraceptives.	COCs are safe and effective in those with CF. Bronchial mucus is not thickened to a major extent (as with cervical mucus) to interfere with contraception. Pulmonary embolism (PE) is a rare event---avoid COCs if other high risk factors for PE are present in CF females.	Can use all methods in those with asthma. If pulmonary tuberculosis is present, rifampin can decrease COC efficacy.
Renal Disease	If the renal disease (including end stage renal disease--ESRD) is stable--- OK to use COCs, DMPA, Mirena IUD/IUS, and barrier contraception.	COCs are safe for ESRD if renal state is not impaired (stable) with no hypertension, cardiovascular disease, and thromboembolism. Estrogen is contraindicated in those with ESRD with significant hypertension or if bed-ridden. Avoid DMPA if bone-loss is of concern. Avoid the IUD with increased risk of endometritis and worsening anemia.	COCs may improve menorrhagia in some with ESRD.
Rheumat-oid arthritis (RA)	COCs, Depo-Provera, Barriers	Potential concern with IUDs due to potential infection. Females with severe RA may have difficulty inserting a vaginal ring, diaphragm, cervical cap, or other barrier contraceptives.	Avoid COCs is there is increased risk for vasculitis, atherosclero-sis, or ischemia. See possible drug interactions between COCs and RA drugs, such as warfarin, corticosteroids cyclosporine, and some anticonvul-sants.
Sickle Cell Disorders (SCD)	COCs, Depo-Provera, Barriers	Pregnancy increases risk for both mother and fetus. COCs do not increase risk due to sickling; Depo-Provera may reduce sickling crises. Pregnancy is associated with increased adverse health effects in sickle cell disease (CDC, 2010)	Sickling is a different process than thrombosis and thus, COCs do not increase risk for thombosis.
SLE (Systemic Lupus Erythem-atosus)	COCs may be the best choice.	Avoid COCs in the presence of vasculitis, nephritis, or APLS. Avoid the progesterone drospirenone if renal failure noted since hyperkalemia can develop. Pregnancy is associated with increased adverse health effects in SLE (CDC, 2010).	DMPA may worsen bone loss already present in SLE patients. Avoid the IUD due to the lowered immune status of SLE patients.

Table 19. (Continued)

Disorder	Recommended Methods	Concerns	Additional Comments
Thyroid Disease	All methods are acceptable.	No contraindications for contraception with hyper/hypothyroidism.	If on levothyroxine, check T_4 and TSH levels after two OC cycles
Schizo-phrenia	DMPA and IUDs	Some females find it difficult to use COCs or use barriers due to limited mental health status.	Sterilization remains a complex and highly controversial concept in contemporary society.
Miscell-aneous	HIV. DMPA works well. Alternative: IUD.	HIV: Potential drug interactions between COCs and certain anti-HIV drugs; some cause decrease in estrogen (*lopinavir/ritonavir* and *nevirapine*) and some cause an increase in estrogen (*atazanavir* and *efavirenz*).	HIV: use condoms as well to protect partner from HIV transmission. Pregnancy is associated with increased adverse health effects in HIV/AIDs (CDC, 2010).

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Internet Sites

- American College of Obstetrics and Gynecology: http://www.acog.org
- Alan Guttmacher Institute, New York: http://www.agi-usa.org/index.html
- Association of Reproductive Health Specialists: http://www.arhp.org
- Cochrane Library: http://hiru.mcmaster.ca/cochrane/cochrane/cdsr.htm
- Journal of the American Medical Association-JAMA Contraception Information Center: http://www.ama-assn.org/special/contra.html
- European Journal of Contraception and Reproductive Health: http://www.tandf.co.uk/journals
- Family Health Institute: http://www.fhi.org
- Center for Disease Control, Atlanta, Georgia, USA: http://www.health.gov/healthypeople/
- World Health Organization Medical Eligibility Criteria: http://www.who.int/reproductivehealth/publications/RHR_00_2_medical_eligibility_second_edition/index.ht
- Emergency Contraceptives Info: http://www.not-2-late.org

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